

CROP DAMAGE CAUSED BY BLACKBUCKS (*ANTILOPE CERVICAPRA*) AT KARERA GREAT INDIAN BUSTARD SANCTUARY, AND POSSIBLE REMEDIAL SOLUTIONS¹

Jagdish Chandra²

(With three text-figures)

Key words: blackbuck, crop damage, great Indian bustard (GIB), sanctuary, management, culling, capture.

An alarming increase in the population of the blackbuck, (*Antelope cervicapra*), at Karera Great Indian Bustard Sanctuary, has been a cause of concern for its nuisance value as a pest of agricultural crops. This paper deals with two and half years of efforts to resolve the problem, along with possible remedial solutions. Efforts were made to catch the animals to translocate them to Madhav National Park, Shivpuri. On experimental basis, one animal was captured alive, but later it died of shock within the enclosure, therefore the process was discontinued. Crops like Mung (a pulse) and Ramas (a bean) were sown near the affected fields so as to reduce the pressure of grazing on the privately owned agricultural fields. Experts from the Wildlife Institute from India, Dehradun, were requested to survey and evaluate the crop damage, and to suggest alternatives to mitigate this problem. Their findings are still awaited.

INTRODUCTION

In 1981, the State Govt. of Madhya Pradesh declared Karera Great Indian Bustard Sanctuary, near Shivpuri district, to protect the Great Indian Bustard and other wildlife. Evidently, it was aimed to provide fullest protection to this bird. As a result, other fauna of the sanctuary also started increasing. I took over as the first superintendent of the Karera GIB sanctuary, in January 1983, and estimated the population of blackbucks to be around 150. With protection and management, their population increased alarmingly and in the year 1991, it was estimated at 2626 animals. Such an increase resulted in the problem of crop raiding in the cultivated fields (Prasad, 1982). This paper reports the observations and studies made from 1985 to 1988, for two and half years. Steps were also taken to mitigate the crop damage problem. Proposals and

project reports were sent to the Chief Conservator of Forests (Wildlife), M.P., Bhopal, to cope with this problem.

Distribution of Blackbuck:

In India, blackbuck used to be distributed from northwest to south-central India, almost everywhere, except for the thickly forested areas of Kerala, and high forests of Madhya Pradesh. It is also not found on the high altitudes of Uttar Pradesh, Jammu & Kashmir and in the Eastern parts of the country, (Ranjitsinh, 1982, Prasad, 1982). (Map-1). As early as 1947, the population was estimated at 80,000 heads, but by the end of 1964 only 8,000 remained (Prasad, 1982). After the enactment of the Wildlife (Protection) Act, 1972, and owing to protection, the blackbuck population increased considerably. Presently, their population is variably estimated to be around 11,000 plus (Prasad, 1982), and more than 22,500 (Ranjitsinh, 1982). The statewise populations are given in Table 1.

¹ Accepted August, 1995

² Assistant Director, Pench National Park, Barapathar 480 661, Seoni (M.P.) & Ex.- Superintendent, GIB Sanctuary, Karera.



Fig. 1 Present distribution of blackbuck in India

Apart from this, more than 350 animals have been reported from various parts of Seoni, Rajnandgaon, Raisen, Hoshangabad, Gwalior, Mandsaur, Vidisha, Guna, Damoh, Narsingarh and Shahdol district (Ranjitsinh, 1982).

of the Shivpuri district of Madhya Pradesh, the Karera Great Indian Bustard Sanctuary covers an area of 202.21 sq. km, and lies between 25° 30' to 45' lat. and 78° 5' to 15' long. The main sanctuary area is 20 km from Karera.(Map 1)

The Karera Sanctuary:

Located in the Karera and Narwar Tehsil

Geology and Topography:

Most of the terrain is plain, with gentle

TABLE I
THE DISTRIBUTION OF BLACKBUCK IN INDIA

State	Ranjitsinh, 1982	Prasad, 1982
1. Andhra Pradesh	670+	690
2. Gujarat	2300+	2035
3. Bihar	35	Not reported
4. Haryana	50	Not reported
5. Karnataka	2800	1100+
6. Madhya Pradesh	1300	55+
7. Maharashtra	500	Present (Nos. not reported)
8. Rajasthan	7600+	4220+
9. Orissa	700	140+
10. Tamil Nadu	1850	1818
11. Uttar Pradesh	940	142+
12. West Bengal	37	37
Total	22648	11237

In Madhya Pradesh, blackbuck are reported in the following protected areas (Ranjitsinh, 1982):

	approx popln.
Noradeshi Sanctuary, Sagar	466
Bagdara Sanctuary, Sidhi	313
Kanha National Park, Mandla	30
Karera Sanctuary, Shivpuri	80
Madhav National Park, Shivpuri	26
Palpur Sanctuary, Morena	20
Chambal Ghariyal Sanctuary, Morena	113
Total	1048

slopes and undulations which can be seen more toward the east and northwest of the sanctuary. However, a few chains of hills which are exposed on the top and look saddle-shaped are also scattered over the area. The highest peak is 368 m above msl. The sanctuary area has sandy loam and laterite (Murrum) soil, but low lying areas have shallow black cotton soil. Boulders and stone consisting of granite mixed with quartz are frequently seen near the foothills and on the elevated areas. Two roads, namely Karera-Behgawan and Karera-Sunari, trisect the sanctuary (Map 3). There are seven man-made wetlands interspersed within the sanctuary; these are Ronija tank, Barsori tank, Berkhera tank, Karai-Ramgarha tank, Gadhai tank,

Baraua tank and the Dihalia jheel. Constructed mainly for irrigation and fishery, one of them is famous (Dihaila jheel), and is the largest water body inside the sanctuary. About 377 ha in area, this jheel is visited by tens of thousands of migratory birds in the winter season (Chandra, 1987). It has been proposed as a Ramsar site (Rahmani, 1987).

Vegetation:

Most of the sanctuary land is barren, with scattered vegetation, mostly comprising ber (*Ziziphus jujuba*), babool (*Acacia nilotica*), etc. Kardhai (*Anogeissus pendula*) trees, found on most of the hills, are now growing horizontally because of overgrazing. One can still see the old remnants of kardhai as sacred groves in some of the plain areas of the sanctuary. According to Champion and Seth (1968), the sanctuary area comes under the Northern Tropical Dry deciduous Forest (5B/D54) type.

Climate:

There are three distinct seasons, viz. summer (March-June), rain (July-October), and winter (November-February). Temperature varies from a minimum of 4°C in winter to 46°C in the summer. Sometimes the ground temperature goes up to 48°C in the peak summer. Annual rainfall varies from 65.00 cm to 75.00 cm mostly in the months of August-September.

Human Settlements:

The Karera Great Indian Bustard Sanctuary is peculiar in that out of 202.21 sq.km., only 56 ha belong to the forest department, the rest being private holdings (145.31 sq.km), revenue department (55.55 sq.km) or is covered under village constructions (1.35 sq.km). There are 33 villages spread over the sanctuary, out of which one is abandoned. Nearly 27,000 (census 1981) people reside in the sanctuary i.e. about 133.50 persons per sq.km.

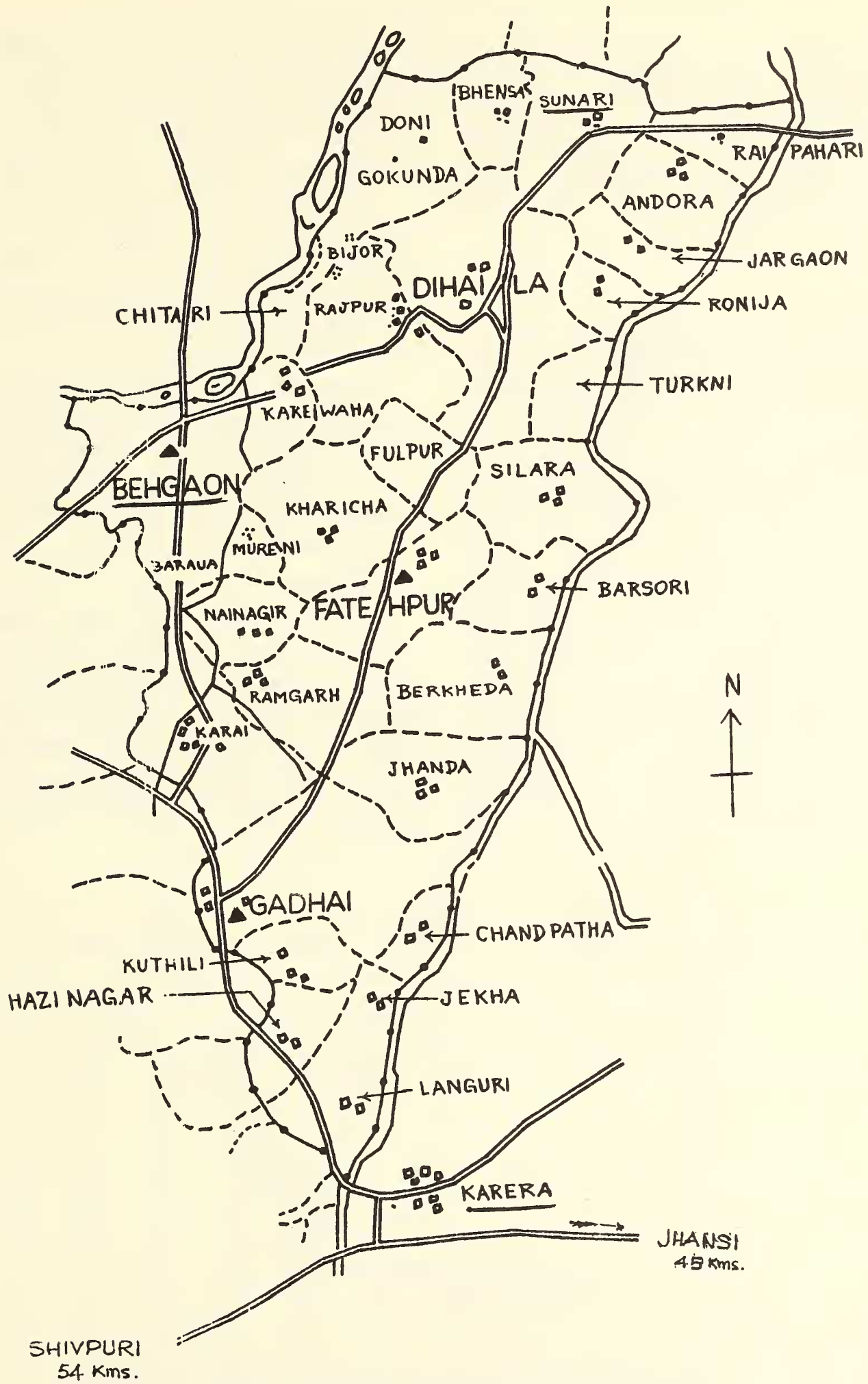


Fig. 2 Map showing the villages inside sanctuary

Livestock:

According to the 1981 census, the cattle population in 32 villages inside the sanctuary is around 36,000, which includes cows, buffaloes, goats and sheep. Other animals such as pigs, dogs, and donkeys are also present. Cattle density is about 178 heads per sq. km.

Land use:

Almost all revenue and private lands are used for cattle grazing. Blackbucks are directly competing for food and are always at loss, due to heavy biotic pressure. Villagers, who have leased out land from the District (Revenue) authorities, often dig wells and construct houses and cultivate crops near the agriculture site. Thus, agricultural fields are interspersed irrationally. Attempt has never been made to cultivate the fields in contiguous areas. Study reveals that unplanned land use has further shrunken the available land, therefore village land has covered up to 1.66 sq.km, revenue land 52.43 sq.km and private land 148.12 sq. km. The number of wells, hutments etc. constructed in the main study area during the past five years are given in Table 2.

Other activities such as quarrying, fishing, governmental transportation and cow dung collection are regular practices. Human impacts include construction of irrigation canals, electrification of houses and road repairs.

Two crop seasons prevail in the area. The winter or Rabi crops include wheat (*Triticum vulgare*), Bengal gram (*Cicer arietinum*), lentil (*Lens esculentus*). Rainy season or Kharif crops include maize (*Zea mays*), til (*Sesamum indicum*), paddy (*Oryza sativa*), etc.

Seasonal vegetables such as potatoes, radish, ladies finger, etc. are also grown. Wheat is grown over 30.38% of the area, followed by gram (11.54%), maize (10.55%), groundnut (7.71%) and paddy (2.93%). (Source: District statistical data, Shivpuri, 1981).

The Blackbuck:

In 1981, when Karera was declared as a Great Indian Bustard Sanctuary, there were about 150 blackbuck in it. Ranjitsinh (1982), however, reported a population of only 80. Thereafter, the author counted 1169 animals in 1988 (Table 3), and the present population is reported to be 2626 animals (Census 1991). Census data for 1984-88 are given in Table 3.

TABLE 2
FIVE YEARS OF DEVELOPMENT IN CONSTRUCTION WORK IN KARERA GIB SANCTUARY

Village	Total No. of wells in 1981	New wells & hutments									
		(1983)		(1984)		(1985)		(1986)		(1987)	
		well	hut	well	hut	well	hut	well	hut	well	hut
Fatehpur	107	2	—	2	1	4	2	2	1	2	1
Silra	60	2	1	1	—	2	1	2	1	3	2
Barsoari	25	1	—	1	1	1	—	2	1	2	1
Kharicha	97	2	1	5	2	5	2	4	2	2	1
Dihaila	40	1	—	1	—	1	—	3	1	2	—
Turkani area	4	2	1	2	1	1	1	1	—	1	1
Rajpur	40	3	1	—	—	3	1	3	1	1	—
Karewah	9	3	2	1	—	—	—	—	—	1	1
Behgawan	34	2	1	3	1	6	2	4	2	2	1
Berkhera	5	2	—	3	1	6	2	2	1	9	4
Total	424	20	7	19	7	30	11	23	10	27	12

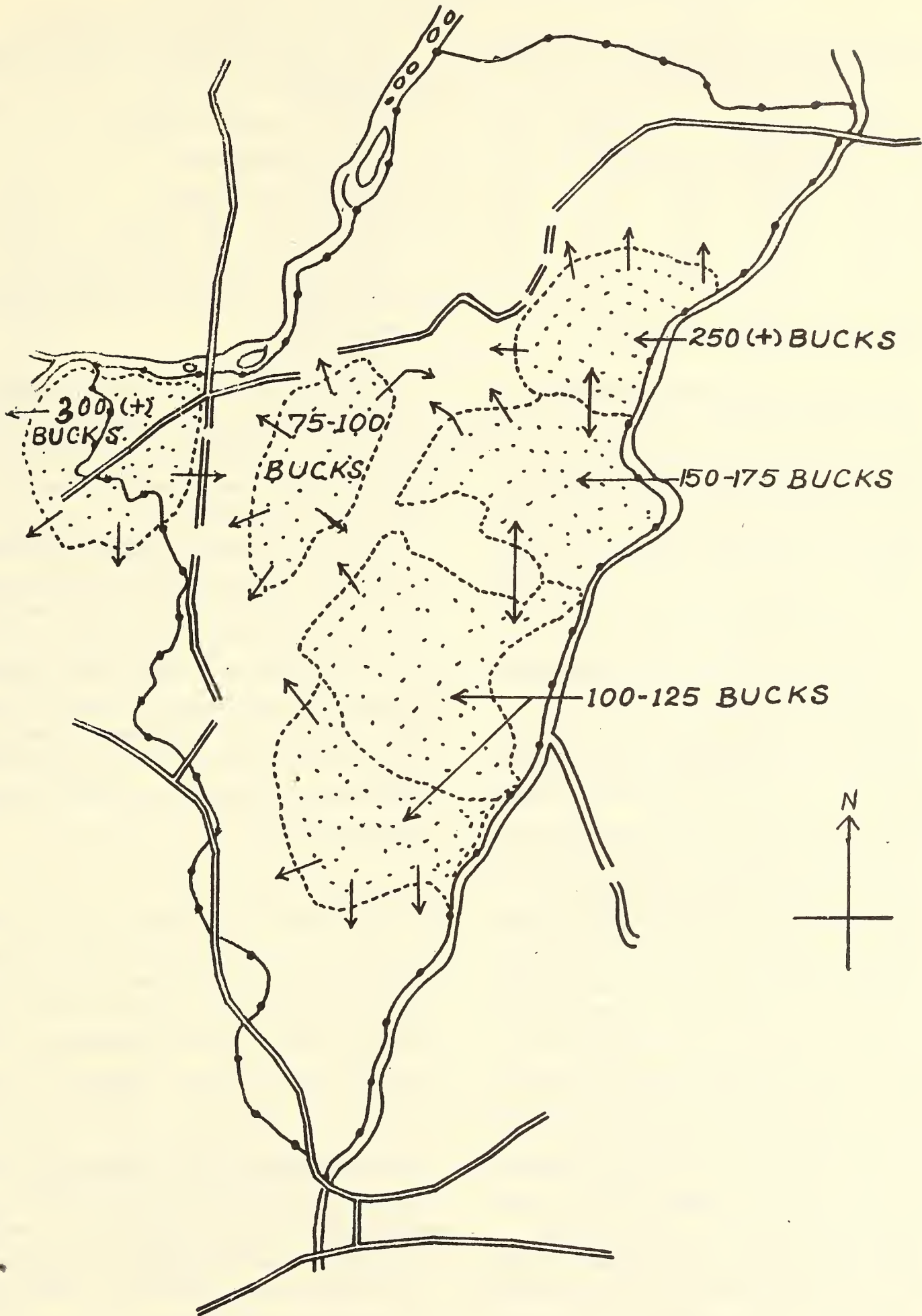


Fig. 3 Map showing distribution of blackbucks and their movement

TABLE 3
CENSUS FIGURES FOR BLACKBUCK IN KARERA,
GIB SANCTUARY

Year	Male	Female	Fawn	Unsexed	Total
1984	Census not carried out, but estimated.				187+
1985	45	185	55	21	306
1986	110	205	80	61	456
1987	215	320	140	90	765
1988	279	452	297	141	1169

* See Appendix 1 for graphical representation.

Blackbucks are distributed throughout the sanctuary except for the extreme north and southwest. However, they are less frequently seen on the hills, near the wetlands and areas with black cotton soil. The following are the main areas of their distribution inside the sanctuary (Map 4).

Turkani: This is one of the areas highly populated with blackbucks and is also a core area for the bustards. The Mahuar river in the east forms a natural barrier. This area is about 400 ha with around 250 animals.

Behgawan: This is the largest habitat in the sanctuary for blackbucks, towards the West it extends up to Naraua and Dhamdauli villages, outside the sanctuary. As many as 300 animals are seen here. Animals of this area visit the Bauraua and nearby villages frequently.

Karewah: On the left bank of Kharicha hill, this area has a population of about 100 animals.

Berkhera/plantation: In the southeast of the sanctuary, this is another good area for blackbucks. About 20 ha miscellaneous plantation in this area gives an ideal cover for blackbucks. Almost equal to Turkani in area (along with the plantation of 20 ha), this area is more under pressure because of the Berkhera water body, which is about 104 ha in area. Approximately 200 animals are seen here.

Rasori-Kundpatha: About 200 ha in extent, this area is almost centrally located, and falls around Fatehpur, Silra and Kharicha villages. Due to extensive agriculture, not much area is left barren.

Social structure of blackbuck populations:

The following types of social grouping were observed: .

1. Solitary or territorial male,
2. Group of adult males,
3. Group of adult females,
4. Females along with young,
5. Group of sub-adult males,
6. Mixed herd consisting of bucks and does of various ages,
7. Sub-adult females,

I always found the maximum number of animals in the 4th group above. As many as 93 animals were counted in one such group. Ranjitsinh (1982), has, however, recorded 123 heads near Dholi, Gujarat.

In all, 33 groups were observed during the study period. A total of 1028 blackbuck were counted in June 1988, of which 469 were adult and sub-adult males. This lead to a ratio of 1:2.19 in favour of females. Sharma (1989), indicated this ratio for Karera blackbucks as 1:2.17. Prasad (1982), in his studies elsewhere, has mentioned male to female ratio as 1:1.96, and Ranjitsinh (1982), has indicated this ratio for Velavadar (Gujarat) as 1:2.8.

Feeding and crop damage:

Blackbuck in India are mostly graminivorous (Ranjitsinh, 1982; Mungall, 1978). They have also been reported feeding on *Emblia taeriamcottom* (Schaller, 1967), exotic *Prosopis juliflora* (Dharmakumarsinhji, 1967), *Zizyphus jujuba* berries, leaves of *Acacia nilotica*, and ripe fruits of *Eagle marmelos* (Prasad, 1982). At Karera, almost similar type of feeding habits have been observed for natural vegetation. However, I have also observed them feeding rather raiding on *Anogeissus pendula* leaves. These animals were also observed feeding on the agricultural crops raised in and around the sanctuary area (Table 4).

Ranjitsinh (1982), and Prasad (1982), have also reported on crop raiding by blackbucks.

TABLE 4
SEASONAL CROP DAMAGE AT KARERA GIB SANCTUARY BY BLACKBUCK

Common name of the plant	Botanical name	W h e n c o n s u m e d		
		Summer	Monsoon	Winter
1. Wheat	<i>Triticum vulgare</i>	—	—	**
2. Bengal gram	<i>Cicer arietinum</i>	—	—	****
3. Mustard	<i>Brassica junica</i>	—	—	***
4. Tarmira (Sonha)	<i>Erue sativa</i>	—	—	****
5. Lentil (Masoor)	<i>Lens esculentus</i>	—	****	**
6. Jowar	<i>Sorghum halepense</i>	—	**	*
7. Groundnut	<i>Arachis hypogea</i>	—	***	*
8. Mung	<i>Phaseolous aconitifolius</i>	*	**	—
9. Paddy	<i>Oryza sativa</i>	—	*	*
10. Til	<i>Sesamum indicum</i>	*	**	—

— Not cultivated, * Low, ** Medium, *** High, **** Very high

Quantitative data on crop damage by blackbuck were collected during the study period. Main blackbuck areas were frequently visited and information was collected on the basis of personal interview with farmers. Other staff of the sanctuary also gathered such information. These interviews and studies revealed that more crops were damaged in the high blackbuck density areas. A similar problem was observed in Natal, South Africa, where "reed bucks" cause damage to the agricultural crops (pers. comm. R. Putman, 1987). The damage was observed more on the succulent crops, especially the tender shoots and blades. Damage to wheat, jowar and paddy was mostly at the succulent stage. These crops were less preferred when their leaves became coarser. Species-wise feeding preference was found in the following descending order: Lentil < Sonha < Mustard < Bengal gram < Wheat < Jowar < Mung < Til < Paddy. Crop damage in the villages are given in Table 5.

TABLE 5
ESTIMATED CROP DAMAGE BY BLACKBUCK
INSIDE THE SANCTUARY VILLAGES

Villages	Areas of distribution	Estimated % of crop damage
Dihaila, Ronija Silara	Turkani	Upto 10%
Fatehpur, Kharicha	Rasori-Kundpatha	Upto 7%
Berkhera, Jhanda	Berkhera (Plantation)	Upto 7%
Behagawan, Baraua	Behagawan	Upto 10%
Karewah, Murheni	Karewah	Upto 5%

In subsequent years, it has been found that crop damage is increasing. Species-wise crop damage estimated by Sharma (1989), is given in Table 6.

Measures taken to manage the blackbuck populations:

After the inception of the sanctuary an evaluation of the habitat and land use was made, and proposals were put forward to deal with this problem.

CAPTURE: Efforts were made in 1987, to capture some of the blackbuck and to shift them to Madhav National Park, Shivpuri. For this, long nylon nets about 2.5 m in height were made and spread (like a corral) over the affected areas. Animals were driven towards the netting site to enclose them, but no success was achieved.

In 1988, Mogia or Pardhi tribals who are traditionally animal trappers by profession, were engaged to catch these animals alive. We were able to catch only one doe, but due to shock it died on the same day within the enclosure. Therefore the operation was stopped.

RAISING ALTERNATIVE CROPS: Proposals made to cultivate agriculture crops similar to those by the farmers in the affected areas, so as to reduce the pressure of blackbuck on the cultivated fields. In 1990-91, an area of 32 ha. was cultivated by the forest department by spending about Rs. 76,000/-. In 13 ha. mung and ramias (a kind

TABLE 6
SPECIES-WISE CROP DAMAGE BY BLACKBUCK

Sl. No.	Name of village	Name of the crops	Calculated % of the damage
1.	Behgawan	Bengal gram	14.22%
		Wheat	13.63%
		Lentil (Masoor)	12.50%
		Taramira (Sonha)	17.64%
		Mustard	15.49%
2.	Baraua	Bengal gram	11.90%
		Wheat	11.45%
		Lentil	12.50%
		Taramira	12.71%
		Mustard	8.82%
3.	Murheni	Bengal gram	13.63%
		Wheat	9.22%
		Lentil	20.00%
		Taramira	—
		Mustard	—
4.	Kharicha	Bengal gram	12.21%
		Wheat	8.44%
		Lentil	21.42%
		Taramira	12.50%
		Mustard	15.00%
5.	Gadhai	Bengal gram	9.58%
		Wheat	9.80%
		Lentil	—
		Taramira	3.33%
		Mustard	—
6.	Jhanda	Bengal Gram	10.27%
		Wheat	2.96%
		Lentil	15.00%
		Taramira	—
		Mustard	—
7.	Niwari	Bengal gram	13.98%
		Wheat	11.50%
		Lentil	15.00%
		Taramira	—
		Mustard	—
8.	Berkhera	Bengal gram	10.23%
		Wheat	13.71%
		Lentil	—
		Taramira	—
		Mustard	6.25%

* See Appendix 2 for graphical representation.

of pulse and bean), were sown and in 19 ha. bengal gram was sown. The success achieved is yet to be evaluated, but the effort has been discontinued.

CANALS: The irrigation department is going to build a major irrigation project in the Sanctuary area. This would lead to a great

disturbance in the blackbuck and bustard habitat. Three distributory canals are proposed to pass through the Sanctuary, namely D3, D4 and D5. Diversion of route of one of the irrigation canal D5 was carried out with the help of the Irrigation department so that the GIB and blackbuck habitat is safeguarded. Change in the course of canal D3 is yet to be carried out. However, canal D4 may not affect the habitat so much.

ACQUIREMENT: Near Behgawan, 56 ha of revenue land was acquired through the Collector, Shivpuri, in 1986. It was fenced by a cattle-proof trench from one side, to provide a suitable habitat for the blackbuck and bustard.

A proposal for acquiring the "Turkani" (397.5 ha) habitat was sent to the Collector Shivpuri, so as to make this area suitable for bustard and blackbuck. A proposal to enclose this area was also sent to the Chief Conservator of Forests, (Wildlife), Madhya Pradesh, in 1986.

EXTENSION PROPOSED: A proposal for the extension of the Sanctuary towards the western side of Naraua, Dhamdauli, and Gwalipura villages, was also sent to Bhopal, in 1987, to provide alternate habitat for the blackbuck and bustard.

COMPENSATION: To reduce the loss to the villagers, a proposal for provision of compensation for crop damage was also sent in 1988.

BAN ON LEASE OF THE LAND: District revenue authorities were approached not to issue any "patta" (land on lease) to the villagers. Finally, the Collector, Shivpuri, issued an order on 27th September, 1983, not to lease out any land inside the sanctuary area.

SURVEY: The Wildlife Institute of India, Dehradun and Bombay Natural History Society, were approached from time to time to look into this problem and to suggest alternatives. The former, sent their Scientists in 1987. They were appraised of the situation and taken into the sanctuary for survey, unfortunately no solutions have been received so far.

Other possible measures:

Based on past experiences, we can suggest the following:

1. Physical capture of blackbuck and their translocation to Madhav National Park, Shivpuri, or other similar areas could be tried. Apart from efforts made before, rocket netting, drop netting, capture with noose etc. (Gopal, 1992; Giles, 1981; Sale and Berkmuller, 1988) could be effective solutions.
2. Chemical immobilization and subsequent transportation of these animals to sustainable habitats can also be tried. For this, appropriate drugs, such as rompan, ketamine hydrochloride, hellabrun mixture etc. can be used under expert guidance.
3. Fencing of the proposed Turkani area by chainlink fence and bringing the animals inside it by luring them with artificial feed like gram, mahua (*Madhuca indica*), etc.
4. Fencing of the agriculture crops could be another solution, but as the fields are disjunctly distributed, it would be a very difficult task.
5. Creating a blackbuck sanctuary as a "Sanctum sanctorum" and shifting of the affected villages elsewhere.
6. Fertility control of the animals to reduce the rate of reproduction may be another possibility.
7. As done before, large scale departmental cultivation could also be tried, so that crop raiding on the farmers' cultivation is mitigated. But this is not a long term solution.
8. Culling of the population, if agreed at all the levels, (Putman R., 1984), could be tried.
9. Providing compensation to the villagers for crop damage, but as the number of blackbuck in the sanctuary is increasing, it will not be practical in the long run. However, as compensatory relief it can be tried, to reduce the antagonism from the farmers

ACKNOWLEDGEMENT

I am thankful to the Ex-C.C.F. (WL), of Madhya Pradesh, Shri J.J. Dutta, I.F.S., Shri R.C. Mehrotra, I.F.S., P.M. Lad, I.F.S., Shri Rajesh Gopal, I.F.S. Shri M.K. Mishra, I.F.S. Shri A.K. Sonakia I.F.S. and Dr. A.R. Rahmani for their valuable guidance when I was posted at Karera Sanctuary.

I thank the staff of Karera sanctuary, posted during 1983-88, for their help in carrying out this work.

Thanks are also due to the district revenue authorities and irrigation department of Narvar for providing me timely help in the sanctuary management and shifting the route of canal D5.

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